

# Anuran Evolution and Diversity

Todd W. Pierson  
WFS 433/533  
19 January 2017



Source: Todd Pierson

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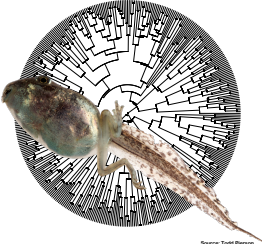
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1. Describe the global evolutionary and ecological diversity of anurans.
2. Describe major patterns in anuran evolution.



Source: Todd Pierson

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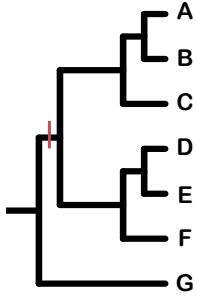
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**Note:** It's wrong to call extant species 'basal' or 'derived'. For more information about this, read the blog post ("The ancestors are not among us") in the supplemental reading.

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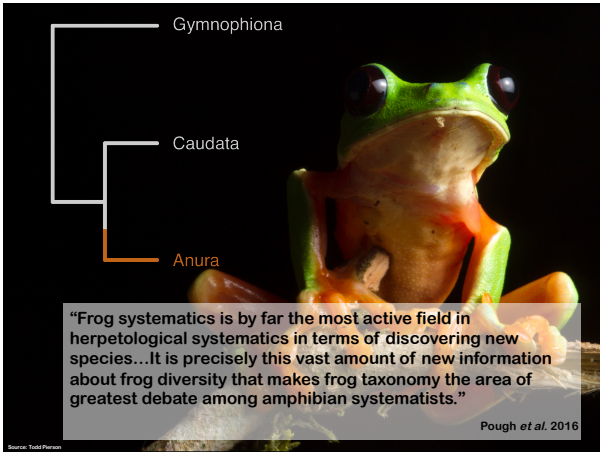
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**In groups of 3-4, imagine a stereotypical frog.**

1. What does the frog look like? Draw it.
2. Where does the frog live?
3. How does the frog move?
4. How does the frog reproduce?

Source: Todd Pincan

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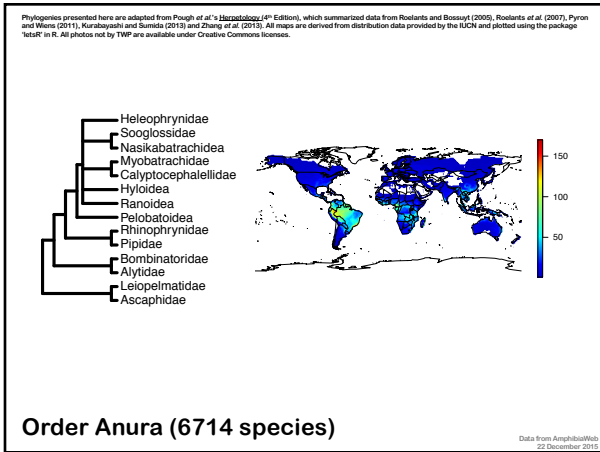
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**Family Ascaphidae (2 species)**

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**Family Leiopelmatidae (4 species)**

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**Family Alytidae (11 species)**

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Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Nasilobatrachidae, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidae, Pelobatoidae, Rhinophrynidae, Pipidae, Bombinatoridae (highlighted), Alytidae, Leiopternatidae, and Ascaphidae.

World map showing distribution of Family Bombinatoridae (10 species) in South America and Africa.

Source: Wilton 2004

**Family Bombinatoridae (10 species)**

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Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Nasilobatrachidae, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidae, Pelobatoidae, Rhinophrynidae, Pipidae (highlighted), Bombinatoridae, Alytidae, Leiopternatidae, and Ascaphidae.

World map showing distribution of Family Pipidae (41 species) in South America, Africa, and Europe.

Source: Brian Gratwicke

Source: Brian Gratwicke

**Family Pipidae (41 species)**

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Phylogenetic tree showing relationships between frog families: Heleophrynidae, Sooglossidae, Nasilobatrachidae, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidae, Pelobatoidae, Rhinophrynidae (highlighted), Pipidae, Bombinatoridae, Alytidae, Leiopternatidae, and Ascaphidae.

World map showing distribution of Family Rhinophrynidae (1 species) in South America.

Source: Allison Bauer

**Family Rhinophrynidae (1 species)**

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**Superfamily Pelobatoidea (213 species)**

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**Family Calyptocephalellidae (5 species)**

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**Family Myobatrachidae (134 species)**

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**Family Nasikabatrachidae (1 species)**

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**Family Sooglossidae (4 species)**

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Heleophrynidae ●  
 Sooglossidae  
 Nasikobatrachidae  
 Myobatrachidae  
 Calyptocephalellidae  
 Hyloidea  
 Ranoidea  
 Pelobatoidea  
 Rhinophrynidae  
 Pipidae  
 Bombinatoridae  
 Alytidae  
 Leiopelmatidae  
 Ascaphidae

Source: Luis Vitorino

**Family Heleophrynidae (6 species)**

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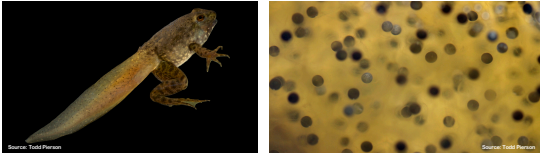
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Heleophrynidae  
 Sooglossidae  
 Nasikobatrachidae  
 Myobatrachidae  
 Calyptocephalellidae  
 Hyloidea  
 Ranoidea ●  
 Pelobatoidea  
 Rhinophrynidae  
 Pipidae  
 Bombinatoridae  
 Alytidae  
 Leiopelmatidae  
 Ascaphidae

Source: Todd Pearson

**Superfamily Ranoidea (2550 species)**




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Heleophrynidae  
 Sooglossidae  
 Nasikobatrachidae  
 Myobatrachidae  
 Calyptocephalellidae  
 Hyloidea  
 Ranoidea ●  
 Pelobatoidea  
 Rhinophrynidae  
 Pipidae  
 Bombinatoridae  
 Alytidae  
 Leiopelmatidae  
 Ascaphidae

Source: Todd Pearson

**Family Ranidae (387 species)**




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**Family Rhacophoridae (405 species)**

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**Family Microhylidae (599 species)**

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**Family Hyperoliidae (228 species)**

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**Superfamily Hyloidea (3729 species)**

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**Family Bufonidae (596 species)**

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**Family Dendrobatidae (306 species)**

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**Family Hylidae (906 species)**

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**Family Craugastoridae (775 species)**

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**(A few) major trends in anuran evolution.**

**Traits**

- Present
- Present in some
- Absent

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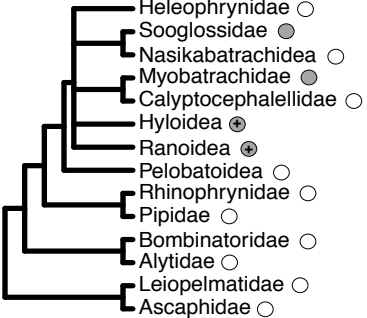
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**Miniaturization**



A phylogenetic tree showing relationships between various frog families. The tree is rooted on the left and branches out to the right. The families listed are: Heleophryinae, Sooglossidae, Nasikabatrachidea, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidea, Pelobatoidea, Rhinophryinae, Pipidae, Bombinatoridae, Alytidae, Leiopelmatidae, and Ascaphidae. Each family name is followed by a small circle, which is either empty or contains a symbol (a dot or a plus sign).

- Heleophryinae ○
- Sooglossidae ●
- Nasikabatrachidea ○
- Myobatrachidae ●
- Calyptocephalellidae ○
- Hyloidea ⊕
- Ranoidea ⊕
- Pelobatoidea ○
- Rhinophryinae ○
- Pipidae ○
- Bombinatoridae ○
- Alytidae ○
- Leiopelmatidae ○
- Ascaphidae ○

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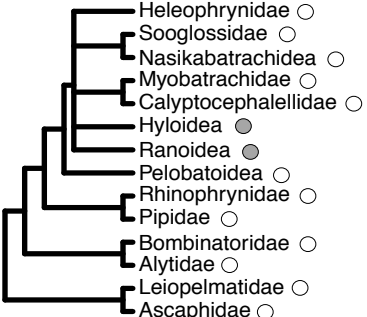
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**What is a treefrog?**



A phylogenetic tree showing relationships between various frog families. The tree is rooted on the left and branches out to the right. The families listed are: Heleophryinae, Sooglossidae, Nasikabatrachidea, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidea, Pelobatoidea, Rhinophryinae, Pipidae, Bombinatoridae, Alytidae, Leiopelmatidae, and Ascaphidae. Each family name is followed by a small circle, which is either empty or contains a dot.

- Heleophryinae ○
- Sooglossidae ○
- Nasikabatrachidea ○
- Myobatrachidae ○
- Calyptocephalellidae ○
- Hyloidea ●
- Ranoidea ●
- Pelobatoidea ○
- Rhinophryinae ○
- Pipidae ○
- Bombinatoridae ○
- Alytidae ○
- Leiopelmatidae ○
- Ascaphidae ○

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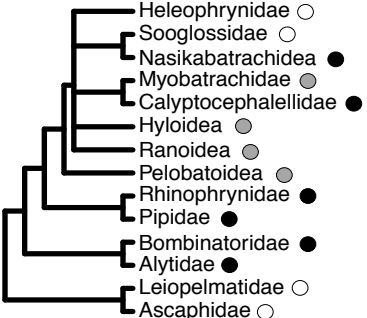
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**What is a toad?**



A phylogenetic tree showing relationships between various frog families. The tree is rooted on the left and branches out to the right. The families listed are: Heleophryinae, Sooglossidae, Nasikabatrachidea, Myobatrachidae, Calyptocephalellidae, Hyloidea, Ranoidea, Pelobatoidea, Rhinophryinae, Pipidae, Bombinatoridae, Alytidae, Leiopelmatidae, and Ascaphidae. Each family name is followed by a small circle, which is either empty or contains a dot.

- Heleophryinae ○
- Sooglossidae ○
- Nasikabatrachidea ●
- Myobatrachidae ●
- Calyptocephalellidae ●
- Hyloidea ●
- Ranoidea ●
- Pelobatoidea ●
- Rhinophryinae ●
- Pipidae ●
- Bombinatoridae ●
- Alytidae ●
- Leiopelmatidae ○
- Ascaphidae ○

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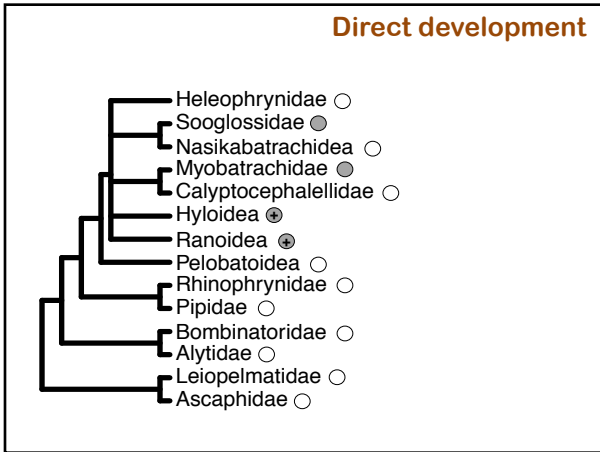
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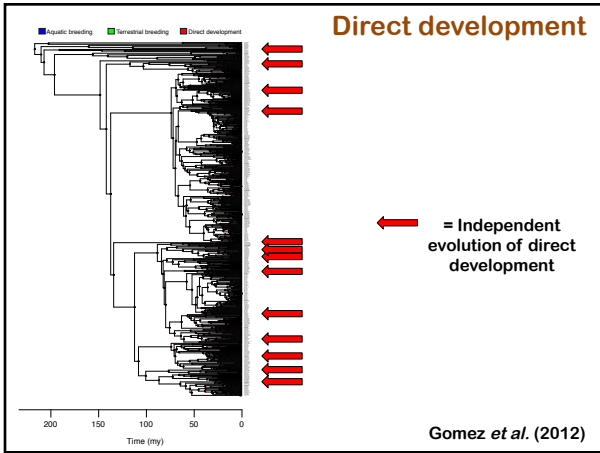
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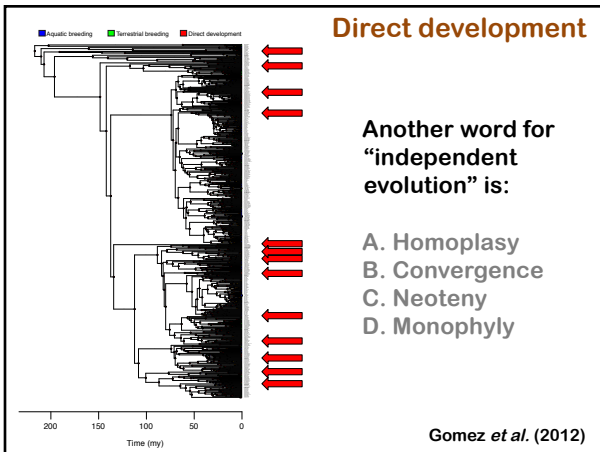
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■ Aquatic breeding   ■ Terrestrial breeding   ■ Direct development

Gomez et al. (2012)

This phylogeny represents part of the group Hyloidea. In this subgroup, “aquatic breeding” represents a:

- A. Synapomorphy
- B. Sympleisiomorphy
- C. Homoplasy
- D. Monophyly

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1. Describe the global evolutionary and ecological diversity of anurans.
2. Describe major patterns in anuran evolution.

Source: Todd Pearson

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Did your frog look like this?

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